ENI

ELECTRONIC NAVIGATION INDUSTRIES, INC.

PRELIMINARY INSTRUCTION MANUAL

MODEL 3100L

RF POWER AMPLIFIER

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PRELIMINARY INSTRUCTION MANUAL

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1.0 INTRODUCTION

The Model 3100L is a broadband solid state power amplifier covering the frequency range of 250 KHz to 105 MHz.

Over 100 watts of RF power can be produced at the output, with low harmonic and intermodulation distortion. A highly linear Class A design, the Model 3100L will amplify inputs of AM, FM, SSB, pulse and other complex modulation, with minimum distortion. The 50 dB gain of the unit permits it to be driven to its full power output by any signal or sweep generator capable of supplying this signal.

The Model 3100L operates over its entire bandwidth without tuning or other adjustments. It is capable of supplying useful power output up to 120 MHz, at reduced gain.

The unit is unconditionally stable and will not oscillate for any possible combination of source and load impedances. It is protected against failure due to output load mismatch and/or overdrive. The Model 3100L will withstand a 13 dB overdrive (input signal of 1 volt RMS) for all output load conditions including both short and open circuits.

Output RF voltage level, as well as power output into 50 ohms, is monitored by a front panel meter. An integral power supply permits operation directly from the AC line.

2.0 SPECIFICATIONS

Frequency Coverage:	120 KHz to 120 MHz
Gain:	50 dB nominal
Gain Variation:	±1.5 dB from 250 KHz to 105 MHz
Maximum Power Output:	More than 100 watts form 250 KHz to 105 MHz. More than 50 watts from 105 MHz to 120 MHz and from 120 KHz to 250 KHz.

Harmonic Distortion:	All odd harmonics more than 25 dB below main signal, at 75 watts output: All even harmonics more than 30 dB below signal at 100 watts output.
Typical 3rd Order Intermodulation Intercept Point:	+59 dBM
Input/Output Impedance:	50 ohms
Input VSWR:	less than 1.5
Output VSWR:	less than 2.0, 250 KHz to 80 MHz (typical), less than 3.0, 80 MHz to 120 MHz (typical)
Noise Figure:	less than 10 dB
Stability:	Unconditionally stable; unit will not oscillate for any condition of load and source impedance.
Protection:	Unit will withstand up to 13 dB of overdrive (input signal of 1 volt RMS) for all output load conditons, including short and open circuit loads.
Output Metering:	Average reading volt meter calibrated in RMS volts for a sine wave, with an accuracy of +3% of full scale (0-100 volts); also calibrated in watts into 50 ohms (0-200 watts)
Power Requirements:	105 - 125 VAC/or 210 - 250 VAC, 50 - 60 Hz 1100 watts
Operating Temperature:	0° to + 40° C
Size:	8 3/4 x 17 x 17 inches
Weight:	69.5 lbs.
Connectors:	Type N

3.0 OPERATING INSTRUCTIONS

The Model 3100L is easy to connect and use. The input and output are connected via the front panel connectors to the signal source and load respectively.

The input signal should be increased gradually while observing the output voltage on the output RF voltmeter. Input signal voltage should never be allowed to exceed 1 volt (RMS) or 1.4 volts (peak).

When the Model 3100L is connected to a 50 ohm load, the CW power output of the unit may be read directly from the meter scale.

When the amplifier is connected to an arbitrary or unknown load impedance, the following procedure will insure low distortion power output.

(1) Disconnect the output load cable from the output connector of the Model 3100L.

(2) If the CW output voltage is less than 100 volts RMS, the unit is operating at low distortion regardless of the load impedance.

(3) Reconnect the output of the amplifier to the load.

If the output of the amplifier is monitored by a high frequency oscilloscope (or spectrum analyzer), the input signal may be increased until the point of maximum undistorted power output is observed.

4.0 TEST PROCEDURE

To determine proper operation of the Model 3100L, the following test procedure should be used:

(1) Connect a sweep generator capable of sweeping the frequency range of 1 to 105 MHz to the input connector.

(2) Adjust the output level of the sweep generator so that a 50 ohm video detector connected at the output will not be damaged by excessive power.

(3) Connect the 50 ohm video detector to the output of the Model 3100L.

(4) Observe the gain versus frequency ripple on an oscilloscope calibrated in decibels.

(5) The gain variation over the frequency range should be less than ±1.5 dB.

(6) Connect a calorimetric power meter (e.g., HP434A) through a short length of 50 ohm cable and a 30 dB attenuator (Bird 8321 or equivalent) to the output connector.

(7) Adjust the input CW signal level (at any frequency between 0.25 and 110 MHz) until the front panel meter reads 100 watts. Compare this with the reading of the calorimetric wattmeter. They should be within ±6 watts.

(8) Observe the output signal on a spectrum analyzer connected to the output through at least 40 dB of external attenuation. The individual harmonics contributed by the amplifier should be greater than 20 dB down from the fundamental.

5.0 CIRCUIT DESCRIPTION

A block diagram of the entire 3100L is shown in Figure 1.

Input signal from the front panel is fed to the Preamplifier Module A27. The preamplifier has eight equal amplitude and phase outputs. These are fed via RG 174 coaxial cable to the inputs of the eight Power Amplifier Driver Modules (A1D). Each preamplifier channel has an overall gain of 13 dB and a maximum power output of 100 milliwatts into 50 ohms. A factory adjusted peaking control compensates for the high frequency gain roll-off of the power amplifier modules.

The driver modules (A1D) are two tandem stage push-pull units capable of supplying more than 3 watts of power into any load impedance.

The output of the A1D modules are gain and phase matched and fed to the inputs of the opwer amplifier modules (A21B).

The 3100L achieves its high power output by combining the power outputs of thirty-two separate power amplifier stages. These stages are combined in groups of four in the Power Amplifier Modules (A21B). These stages are highly isolated by hybrid combiners so that between stage interaction is negligible. The A21B modules are capable of producing more than 15 watts of power over the entire frequency range.

POWER AMPLIFIER DRIVER MODULE AID
Gain=20 dB
P max=3 watts

3 w

POWER AMPLIFIER MODULE A 21B
Gain = 20 dB
P max = 3 watts

15 w

POWER AMPLIFIER DRIVER MODULE

3 w

POWER AMPLIFIER MODULE

15 w

30 mw

POWER AMPLIFIER DRIVER MODULE

3 w

POWER AMPLIFIER MODULE

15 w

30 mw

POWER AMPLIFIER DRIVER MODULE

3 w

POWER AMPLIFIER MODULE

15 w

PRE AMPLIFIER MODULE A27
Gain = 13 dB
P max = 100 mw

30 mw

POWER AMPLIFIER DRIVER MODULE

3 w

POWER AMPLIFIER MODULE

15 w

30 mw

POWER AMPLIFIER DRIVER MODULE

3 w

POWER AMPLIFIER MODULE

15 w

POWER AMPLIFIER DRIVER MODULE

3 w

POWER AMPLIFIER MODULE

15 w

POWER SUPPLY

POWER SUPPLY REGULATORS A28

FINAL COMBINER MODULE A 29

SOLENOID MODULE A 30

OUTPUT

115/230 VAC

FRONT PANEL LIGHTS

FRONT PANEL LIGHT

FIGURE 1

Each of the eight modules are fed to the Final Combiner Module (A28). This module combines the output powers in a low-loss high isolation hybrid circuit.

The voltmeter module is connected to the output connector. It samples the RF voltage present at that point and produces a DC voltage proportional to its average value. This DC output is fed to the front panel meter, which is calibrated in RMS volts for a sine wave. Absolute calibration of the voltmeter is accomplished by a variable control mounted on the module.

The entire unit is powered by a regulated power supply capable of supplying 27.5 volts (approximately) at a current of thirty-two amperes. The power supply circuit module is mounted directly below the inverted "U" in the path of the forced air cooling. DC voltage adjustment is accomplished by variable controls mounted in the A26 power regulator board. A short circuit protection control is set at the factory to protect against damage due to inadvertent (short time) output short circuits. The AC input current is fed in series with a thermostat mounted on the base plate in front of the cooling fan. Should the fan fail or an obstruction in the fan screen prevent adequate cooling, the thermostat will open and prevent damage to the unit.

6.0 REGULAR ADJUSTMENT AND MAINTENANCE

There are no periodic electrical adjustments required to maintain the amplifier gain and power output characteristics.

7.0 LINE VOLTAGE VARIATION

The 3100L is designed to operate over a wide range of 50 to 60 Hz AC line voltage. A series of transformer taps are brought out to terminal board TB1 located directly under the fan on the rear base mounting plate. To change operating voltage, remove the back plate and arrange the location of the four wires on the numbered terminals. Under no circumstances should this operation be carried out while power is still connected to the unit.

The 3100L is normally supplied from the factory at the 115 VAC for domestic delivery and 230 VAC for European delivery. Check the marking of the line cord before connecting to 230 VAC.

LINE VOLTAGE	BLACK	WHITE	BLUE	RED
107.5	3	1	1-2	3-4
115	6	1	1-2	5-6
120	8	1	1-2	7-8
215	4	1	2-3	Remove
230	6	1	2-5	Remove
240	8	1	2-7	Remove

LINE VOLTAGE VS. CABLE CONNECTIONS AT TB1

8.0 CASE REMOVAL

Remove all the screws located on both sides and top of the cover and slide the cover backwards approximately one inch and lift off. To reassemble, simply reverse the process. When replacing the cover, care should be taken that the case does not come in contact with the internal amplifier cabling.

9.0 RACK INSTALLATION

The Model 3100L will mount directly in a standard 19 inch relay rack.

In order to fit the 3100L in the 17¾ inch opening of a 19 inch rack, the side handles must be removed. To do so, remove the cover and unscrew the side handle. Do not unscrew the handles when the case is closed, as this will cause the retaining hardware to fall into the amplifier assembly.

After replacing the cover, line up the rack retaining brackets with the three vertical holes in the front of each side of the cover (there is a right and a left bracket). Tighten all screws in the cover and attach the unit directly into the rack. The extended feet on the bottom plate may be unscrewed from their retaining plates to enable maximum usage of the rack.

10.0 PRECAUTIONS

(1) The Model 3100L output is at DC ground potential through the final combining transformer. Therefore, the output should not be directly connected to a load on which there is a DC potential. If the output load has a DC potential, insert a series capacitor with the appropriate voltage breakdown rating (.1 mfd is the recommended value) between the load and the output cable.

(2) The input and output of the Model 3100L should not be connected together. This will cause oscillation and may damage the input preamplifier.

(3) The 3100L should not remain connected to an antenna when the unit is not in use. If thunderstorms are likely, it would be prudent to earth ground the unit's case.

(4) When the input signal voltage of a drive soruce is unknown, insert an attenuator between it and the Model 3100L input.

11.0 TROUBLESHOOTING

If the Model 3100L should fail to operate, and the panel light does not glow, check the condition of the fuse at the rear of the unit (15 amperes).

The Model 3100L circuit modules should be serviced only by the factory or its authorized facility. However, ENI will supply pre-aligned and calibrated module boards as replacement items.

DO NOT ATTEMPT to probe the circuit modules while they are mounted in the amplifier,case, as extensive damage may result.

12.0 FACTORY SERVICE

When factory service is required, the following steps should be taken:

(1) Notify ENI, giving full details of the difficulty. Include the instrument's serial number.

(2) Upon receipt of shipping instructions, forward the instrument, transportation prepaid, to the factory or to the authorized repair station indicated on the instructions.

If requested, an estimate of the charges will be made before the work begins, provided the instrument is not covered by the warranty.

W A R R A N T Y

Electronic Navigation Industries, Inc. warrants each instrument to be free from defects in material and workmanship. Our liability under this warranty is limited to servicing and replacing any defective parts for a period of one (1) year after delivery to the original purchaser.

When warranty service is required, the instrument must be returned transportation charges prepaid to the factory or our authorized service facility. If, in our opinion, the fault has been caused by misuse or abnormal conditions of operation, repairs will be billed at cost. In this case, an estimate will be submitted before the work is started.

There are no other warranties expressed or implied, including any warranty of merchantibility or fitness. Seller shall not be responsible for any incidental or consequential damages arising from any breach of warranty.

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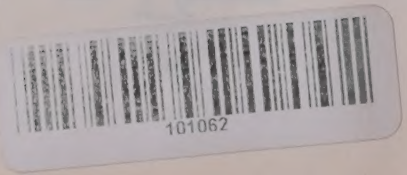
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